

## 2 THE BASIC OPEN-HEARTH STEEL PROCESS

in the molten state, and is then cast into ingots, which are afterwards shaped by means of rolling or forging according to the desires of consumers.

The action of oxygen on the foreign constituents in the iron only takes place at high temperatures, and the degree of fluidity of the steel required to give a smooth casting involves it being heated to nearly 1700°. In steel manufacture it is therefore a paramount consideration to have considerable amounts of highly intense heat at disposal. In both typical forms of pneumatic refinement the acid and the basic Bessemer processes, the vessel employed, i.e., the converter, derives a great portion of the necessary heat from other apparatuses. The raw material, pig iron, which is supplied from the blast furnace, the cupola, or the reverberatory furnace in a molten state, is already at a temperature of at least 1,250°, which suffices for beginning of the reaction. After the introduction of the molten iron, into the converter, air is blown through, the oxygen of which attacks the foreign constituents. By their elimination the melting point of the metal is raised, and thereby creates a heat requirement which must be supplied. This can be overcome by selecting for working such classes of pig iron as contain materials which, by their oxidation or burning out by means of cold air, evolve great amounts of heat. The latter proviso is only essentially fulfilled by two materials, namely, silicon and phosphorus; both are found in all pig irons, but in different amounts.

The oxidation of the silicon and phosphorus in pig iron proceeds under quite settled conditions, which involve that, in the acid converter only the silicon, in the basic, in the main, only the phosphorus are available as sources of heat. Therefore one is extremely limited in the selection of the materials which provide the heat. Over and above this one must employ so great an amount of the respective materials that their content of energy suffices to supply the total energy requirement, which, owing to the raising of the melting point of the metal on the one hand, and owing to the rapidly

1 Throughout temperatures are given in degrees centigrade and the metric system of weights and measures is employed in this book.